R.A. and Decl. of B.D. + 30°, 1306, is $6^h\ 36^m\ 31^s{\cdot}44 + 30°\ 4'\ 59''{\cdot}4$, and of B.D. + 30°, 1320 R.A. is $6^h\ 39^m\ 7^s{\cdot}30$, Decl. + 30° 17′ 13″·6. The other two stars have already been given in the catalogue under No. 23 and 143.

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On the Position of X Geminorum. By F. A. Bellamy.

This star is on both the plates (2222 and 2240) discussed in the preceding paper, and the measures and reductions have been made in precisely the same way.

Stars No. 5, 6, 7, were measured, both exposures, on plate 2222, and corrected for the mean of the two sets of constants derived from the first and second set of exposures; stars 1 to 9 were measured on plate 2240. The positions 1 to 4, 8 and 9 depend upon direct and reverse measures on the latter plate only, 5, 6, and 7 are the means of the measures on both plates. The following are the positions (1900·0) for these few stars near *X Geminorum*:

Oxford No.	Diameter.	Inferred Mag.	Standard Coordinates. ξ_1	η_1	Deduced. R.A. 1900·0. h m s	Decl. 1900·0. ° ′ ″
1	15	13·8	24·8481	17·2664	6 40 34·57	+30 21 2·0
2	17	13·4	24·9145	17·4173	36·14	21 47·0
3	5	15·3	25·0267	17·4543	38·75	21 57·8
4	7	15·0	25·0565	17·3201	39·41	21 17·4
5	31	11·8	25 0722	17·4325	39·80	21 51·0
6	23	12·5	25·1959	17·8365	42·76	23 51·9
7	28	12·0	25·2112	17·6554	43·08	22 57·5
8	12	14·2	25·2426	17·8293	43·85	23 49·6
9	32	11·2	25·5909	18·0591	51 98	24 57·4

The 7th star best agrees with the approximate place of *X Geminorum* as usually given; but in the case of variable star regions which are rich with stars, especially faint ones, there is some uncertainty about the identification; but I could find no other star nearer to R.A. $6^h\ 40^m\ 43^s + 30°\ 22'{\cdot}6$ * than that given for No. 7, and stars 5, 6 and 9 of the above list agree with *e*, *g* and *d* respectively of Mr. Parkhurst's paper in *A.J.* No. 428.

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* *Astronomical Journal*, No. 428, vol. xviii. p. 160, and No. 514, vol. xxii. p. 78.

On the Relation existing between the Light Changes and the Orbital Elements of a close Binary System, with special reference to the Figure and Density of the Variable Star RR Centauri.

By Alex. W. Roberts, D.Sc.

The number of *Algol* variables, with the peculiar property of rapid and continuous variation recently discovered, brings into prominence the interesting problem of the relation of light variation to orbital movement. The refinement also and completeness which is now rightly insisted on in the observation of any cycle of light changes, due evidently to the eclipse of one star by another, makes the investigation of the problem a more hopeful matter than it would have been several years ago.

The problem is not only of considerable interest, it is also of great importance. Indeed, the determination of the figure of a close binary star solely from the character of the light changes produced by the alternating eclipse of the component bodies is one of no ordinary significance in the present progressive state of astrophysical research. It is an investigation which leads us directly to the wider problem of stellar evolution.

It is also evident that a complete solution of the problem is one of no small difficulty; not because the equations which connect the light variation of a close binary and its orbital elements are of an indefinite character, but because the numerical quantities on which the evaluation of these equations depends are exceedingly small.

Thus the problem, even in its simplest form—that is, when it deals with the revolution of two stars practically in contact—comprises at least the determination of six unknown quantities, representing the figure, relative brightness, relative size, and relative distance of the twin stars. For the determination of these six unknown terms we have only as our argument a variation never much greater than half a magnitude.

That this meagre ebb and flow would yield data for the complete detection of the causes which have produced it, or of the conditions of figure and orbit which have given it a special character, is not to be expected. Yet, although a complete solution of the problem cannot be hoped for at present, it will be helpful, I think, to indicate the amount of certainty that we may reasonably assure ourselves of, and at the same time to state the limitations to the full exposition of the problem which we know to exist.

Put simply, the problem to be solved is this: From the light variation of any close binary system, as determined by observation, to ascertain the orbit and relative dimensions, and also the figure and density of the two stars forming the system.

At the very outset of the inquiry we are compelled to make